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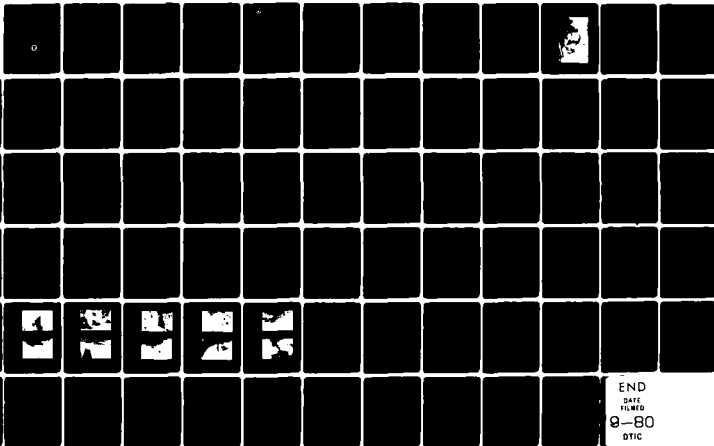
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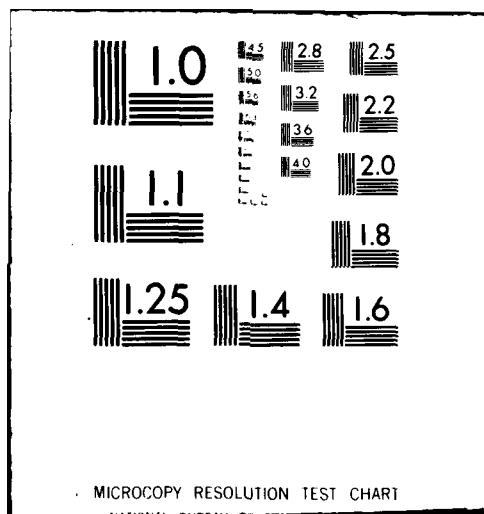
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LEVEL 1
RARITAN RIVER BASIN
BLUE BROOK, UNION COUNTY
NEW JERSEY

SEELEY'S POND DAM
NJ 00368

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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DEPARTMENT OF THE ARMY

Philadelphia District
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FEBRUARY 1980

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.		

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DEPARTMENT OF THE ARMY
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IN REPLY REFER TO

NAPEN-N

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

24 JUL 1980

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Seeley's Pond Dam in Union County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Seeley's Pond Dam, initially listed as a "high" hazard potential structure, but reduced to a "significant" hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The dam's spillway is considered inadequate because a flow equivalent to 40 percent of the 100-year flood would cause the dam to be overtopped. To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The adequacy of the spillway should be determined using more precise and sophisticated methods and procedures by a qualified, professional consultant, engaged by the owner, within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure spillway adequacy should be initiated.

b. Within six months from the date of approval of this report the upstream and downstream faces of the dam should be thoroughly inspected by a professional engineer experienced in the design and construction of dams. The upstream face should be inspected with the pond drawn down and the downstream face should be inspected with the pond partially drawn down. Based on the inspections, together with any necessary further investigations, the need for and type of remedial measures should be determined and then implemented.

c. The outlet works should be investigated and restored to functional condition, if necessary, and the outlet pipe cleaned within six months from the date of approval of this report.

NAPEN-N

Honorable Brendan T. Byrne

d. Within one year from the date of approval of this report the owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

e. The owner should develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam within six months from the date of approval of this report.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Rinaldo of the Twelfth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,



1 Incl
As stated

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

SEELEY'S POND DAM (NJ00368)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 15 November 1979 by Storch Engineers under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Seeley's Pond Dam, initially listed as a "high" hazard potential structure, but reduced to a "significant" hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The dam's spillway is considered inadequate because a flow equivalent to 40 percent of the 100-year flood would cause the dam to be overtopped. To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

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b. Within six months from the date of approval of this report the upstream and downstream faces of the dam should be thoroughly inspected by a professional engineer experienced in the design and construction of dams. The upstream face should be inspected with the pond drawn down and the downstream face should be inspected with the pond partially drawn down. Based on the inspections, together with any necessary further investigations, the need for and type of remedial measures should be determined and then implemented.

c. The outlet works should be investigated and restored to functional condition, if necessary, and the outlet pipe cleaned within six months from the date of approval of this report.

d. Within one year from the date of approval of this report the owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

e. The owner should develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam within six months from the date of approval of this report.

APPROVED: *James G. Ton*

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 1 July 1980

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(15) DHON 61-79-C-0044 | (11) Feb 80 | (12) 78

(6) PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:

Seeley's Pond Dam (NJ00368)

State Located:

New Jersey

County Located:

Union

Drainage Basin:

Raritan River Basin

Stream:

Blue Brook, Union County, New Jersey.

Date of Inspection:

[REDACTED]

Phase I Inspection Program

Assessment of General Condition of Dam

Based on visual inspection, past operational performance and Phase I engineering analyses, the dam is assessed as being in fair overall condition.

Based on investigations of the downstream flood plain made in connection with this report, it is recommended that the hazard potential classification be downgraded from high to significant hazard.

Hydraulic and hydrologic analyses indicate that the spillway is not sufficient to pass the designated spillway design flood (100-year storm) without an overtopping of the dam. The spillway is capable of passing approximately 39 percent of the spillway design flood. Therefore, the owner should engage a professional engineer experienced in the design and construction of dams in the near future to perform more accurate hydraulic and hydrologic analyses relating to the spillway capacity. Based on the findings of the analyses, the need for and type of remedial measures should be determined and then implemented.

The owner should, in the near future develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

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In addition, it is recommended that the upstream and downstream faces of the dam be thoroughly inspected in the near future by a professional engineer experienced in the design and construction of dams. The upstream face should be inspected with the pond drawn down and the downstream face should be inspected with the pond partially drawn down. Based on the inspections, together with any necessary further investigations, the need for and type of remedial measures should be determined and then implemented.

It is also recommended that the outlet works be investigated in the near future and restored to functional condition if necessary and that the outlet pipe be cleaned.

In the near future, the owner of the dam should develop written operating procedures and a periodic maintenance plan to insure the safety of the dam.


Richard J. McDermott, P.E.


John E. Gribbin, P.E.



OVERVIEW - SEELEY'S POND DAM

15 NOVEMBER 1979

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 30214. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that the unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

SEELEY'S POND DAM, I.D. NJ00368

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

Public Law 92-367, August 8, 1972 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The Division of Water Resources of the New Jersey Department of Environmental Protection (NJDEP) in cooperation with the Philadelphia District of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the State of New Jersey. Storch Engineers has been retained by the NJDEP to inspect and report on a selected group of these dams. The NJDEP is under agreement with the Philadelphia District of the Corps of Engineers.

b. Purpose of Inspection

The visual inspection of Seeley's Pond Dam was made on November 15, 1979. The purpose of the inspection was to make a general assessment of the structural integrity and operational adequacy of the dam structure and its appurtenances.

1.2 Description of Project

a. Description of Dam and Appurtenances

Seeley's Pond Dam is a stone masonry dam composed of a spillway section and a wall section. The spillway section, which is curved in the shape of an arch, forms the major portion of the dam. The spillway abuts exposed bedrock at its left or east end and a masonry training wall at its right or west end. The training wall extends upstream along the pond to form the remaining portion of the dam and extends downstream to form the right side of the downstream channel.

According to construction drawings, the spillway is composed of a stone masonry downstream face and crest with the remainder formed with concrete. The upstream face has a slope of 1 horizontal to 1 vertical while the downstream face is constructed with a 1 to 12 batter.

The length of the spillway is 77 feet and its width is 4.5 feet. The overall length of the dam, including the spillway, is 150 feet. The elevation of the spillway crest is 205.6 (N.G.V.D.) while that of the bed of the downstream channel is 188.4. The elevation of the dam crest, which corresponds to the top of the stone masonry wall, is 208.4.

The outlet works consists of a 12-inch diameter pipe extending around the right side of the dam. The outlet is controlled by a valve in a square manhole located immediately to the right and upstream of the spillway. An abandoned outlet pipe penetrates the spillway near its right end. Control for this pipe is housed in a manhole located in the pond and normally submerged.

A graduated staff gage is located in the pond on the upstream side of the stone masonry wall forming the west portion of the dam. A USGS gaging station is located approximately 400 feet downstream from the dam. The gaging station is located downstream of the confluence of the downstream channel (Blue Brook) and the Green Brook.

b. Location

Seeley's Pond dam is located in the Townships of Berkeley Heights and Scotch Plains in the County of Union, New Jersey. Constructed across the Blue Brook, the dam impounds Seeley's Pond which forms a recreational lake in a county park.

c. Size and Hazard Classification

Size and Hazard Classification criteria presented in "Recommended Guidelines for Safety Inspection of Dams," published by the U.S. Army Corps of Engineers are as follows:

SIZE CLASSIFICATION

	<u>Impoundment</u>	
	<u>Storage (Ac-ft)</u>	<u>Height (Ft.)</u>
Small	< 1000 and ≥ 50	< 40 and ≥ 25
Intermediate	≥ 1000 and $< 50,000$	≥ 40 and < 100
Large	$\geq 50,000$	≥ 100

HAZARD POTENTIAL CLASSIFICATION

<u>Category</u>	<u>Loss of Life</u> (Extent of Development)	<u>Economic Loss</u> (Extent of Development)
Low	None expected (no permanent structures for human habitation)	Minimal (Undeveloped to occasional structures or agriculture)
Significant	Few (No urban developments and no more than a small number of inhabitable structures)	Appreciable (Notable agriculture, industry or structures)
High	More than a small number	Excessive (Extensive community, industry or agriculture)

The following data relating to size and downstream hazard for Seeley's Pond Dam have been obtained for this Phase I report:

Storage: 101 acre-feet

Height: 20.2 feet

Potential Loss of Life:

A heavily used road (Diamond Hill Road) is located along the bank of the downstream channel for a distance of approximately 3500 feet. Failure of the dam could possibly cause loss of life. Two dwellings located approximately 3000 feet downstream appear to be above the water level resulting from failure of the dam.

Potential Economic Loss:

Diamond Hill Road and automobiles travelling on it could sustain damage as a result of dam failure.

Therefore, Seeley's Pond Dam is classified as "Small" size and "Significant" hazard potential.

d. Ownership

Seeley's Pond Dam is owned and maintained by the County of Union, Department of Engineering, P. O. Box 607, Westfield, New Jersey 07091.

e. Purpose of Dam

The purpose of the dam is the impoundment of a recreational pond in a county park.

f. Design and Construction History

Seeley's Pond Dam was originally constructed prior to 1928 to impound a mill pond. At that time, it was known as Seeley's Mill-Upper Dam and further downstream another masonry dam called Twin Falls Mill Dam (Seeley's Mill-Lower Dam) was located. Twin Falls Mill Dam is presently in ruins.

Reportedly, earth fill was placed along the right training wall in 1928 which was around the time that the dam was acquired by the County of Union. In 1939, a new wall was constructed closer to the road and the spillway was extended to meet the new wall. Also, at that time, the new outlet works extending around the right side of the spillway was constructed. The dam and appurtenances has remained virtually unchanged since that time.

g. Normal Operational Procedures

The dam and appurtenances are maintained and operated by the County of Union, Department of Public Works, Division of Park Maintenance. There is no fixed schedule of maintenance and repairs are made as the need arises.

Reportedly, the outlet gate is not opened during heavy rainstorms. The gate is used, however, to partially lower the lake for maintenance purposes. The lake was last lowered in or around 1975.

1.3 Pertinent Data

a.	Drainage Area	3.4 square miles
b.	Discharge at Damsite	
	Maximum flood at damsite	2080 c.f.s., Aug. 2, 1973 recorded by USGS gaging station downstream from dam (Includes flow in Blue Brook and Green Brook)
	Outlet works at normal pool elevation	6.5 c.f.s.
	Spillway capacity at top of dam (Elev. 208.4)	969 c.f.s.
c.	Elevation (N.G.V.D.)	
	Top of Dam	208.4
	Maximum pool-design surcharge	210.2
	Normal pool	205.8
	Spillway crest	205.6
	Stream bed at centerline of dam	188.4
	Maximum tailwater	200 (Estimated)
d.	Reservoir	
	Length of maximum pool	1,300 feet
	Length of normal pool	850 feet
e.	Storage (Acre-feet)	
	Spillway Crest	40 acre-feet
	Design Surcharge	139 acre-feet
	Top of dam (Elev. 208.5)	101 acre-feet

f. Reservoir Surface (Acres)

Spillway crest	4.5 acres
Top of dam (Elev. 208.5)	9 acres
Maximum pool - design surcharge	11 acres

g. Dam

Type	Masonry
Length	150 feet
Height	20.2 feet
Side Slopes - Upstream	1 horiz. to 1 vert.
- Downstream	1 horiz. to 12 vert.
Zoning	N.A.
Impervious core	N.A.
Cutoff	Unknown
Grout Curtain	N.A.

h. Diversion and Regulating Tunnel N.A.

i. Spillway

Type	Uncontrolled masonry weir
Length of weir	77 feet
Crest elevation	205.6
Gates	N.A.
Upstream channel	N.A.
Downstream Channel	Natural stream

j. Regulating outlets

Gated 12" pipe

SECTION 2: ENGINEERING DATA

2.1 Design

No plans or calculations pertaining to the original construction of the dam could be obtained. Plans, and specifications for the renovations performed in 1938 are available. However, no design computations or reports or geologic reports are available.

2.2 Construction

Monthly progress reports for the 1938 renovations indicating that construction was completed in accordance with the plans are available.

2.3 Operation

Although no data pertaining to the operations of the dam are available, inspection reports made by the State of New Jersey are available.

On October 17, 1935, it was reported that "the earth fill made in 1928 below the old dam has settled badly and two leaks have developed, one of which comes out as a spring in the road below the dam and the other at the right end of the masonry spillway, near the bottom."

On August 4, 1938, it was reported that the dam had been repaired by the Union County Park Commission in 1928 under application No. 119. Also, "the retaining wall along the right side of the pond near the dam has always leaked and been of doubtful stability, and the Park Commission placed a heavy earth fill outside of this wall between the pond and the wall. During the high water of

July 23 seepage through this wall became sufficient to cause the slumping and washout of a considerable portion of this earth fill. The old spillway is in fair condition."

On May 13, 1939, it was reported that renovations to the dam had been completed. The report also noted a small leak in the old dam near its base a few feet away from the new section of the spillway. The writer did not note if the clay fill above the spillway had been placed.

On March 2, 1970, it was reported that the dam was in generally good condition and that the outlet was in satisfactory condition.

2.4 Evaluation

a. Availability

Available engineering data is limited to that which is on file at the NJDEP and the Union County Engineer's Office. The NJDEP file contains correspondence, plans, specifications, inspection reports and photographs and the Union County file contains plans and a topographic survey of the pond and park.

b. Adequacy

Available engineering data pertaining to Seeley's Pond Dam is of limited assistance in performing a Phase I evaluation. A list of absent information is included in paragraph 7.1.b.

c. Validity

Most information that could be verified was found to be valid within a reasonable allowance for error.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

The inspection of Seeley's Pond Dam took place on November 15, 1979 by members of the staff of Storch Engineers. A copy of the visual inspection list is contained in Appendix 1. The following procedures were employed for the inspection:

- 1) The dam, appurtenant structures and adjacent areas were examined.
- 2) The dam and appurtenant structures were measured and key elevations determined with the use of a surveyor's level.
- 3) The dam, appurtenant structures and adjacent areas were photographed.
- 4) Depths of water were measured at various locations in the pond.

b. Spillway

The spillway, which comprises the major portion of the dam, appeared to be outwardly stable with no observed evidence of distress. The crest appeared to be generally level with a slight depression near the center. Discharge over the spillway obscured both the crest and the downstream face. The crest appeared to be composed of a concrete cap over the remaining masonry construction. The concrete cap exhibited some minor cracking and deterioration.

c. Masonry Wall

The masonry wall extending upstream and downstream from the right end of the spillway appeared to be outwardly structurally sound and generally in good condition.

d. Outlet Works

The discharge end of the abandoned outlet pipe was noted to be flush with the downstream face of the spillway and in sound condition.

The discharge end of the functioning outlet pipe was partially obstructed by silt but appeared to be in sound condition. The gate housing manhole was not opened at the time of inspection but appeared to be in satisfactory condition.

e. Reservoir Area

Seeley's Pond is a recreational pond with no development along its shores. The banks, which are wooded and contain many rock outcrops, have an average slope of approximately 2 horizontal to 1 vertical. Soundings in the pond indicated that the bottom contains a layer of silt approximately 6 feet thick.

f. Downstream Channel

The spillway discharges directly into the Blue Brook which flows into the Green Brook approximately 250 feet downstream. The downstream channel is composed of the two brooks and is described as a well defined stream with a bottom lined with cobbles, boulders and rock outcrops.

Diamond Hill Road is located along the channel for approximately 3000 feet. Two dwellings located approximately 3000 feet downstream from the dam lie 13 feet above the channel bed.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

The level of water in Seeley's Pond is regulated naturally by discharge over the spillway of Seeley's Pond Dam. Reportedly, the outlet gate is not opened at times of intense storms to augment the capacity of the spillway.

Reportedly, the outlet gate is opened for the purpose of partially lowering the pond to facilitate maintenance operations. The most recent drawdown was performed in or around 1975 when the downstream face of the spillway was rehabilitated.

4.2 Maintenance of the Dam

Reportedly, maintenance is performed on an "as needed" basis. The most recent maintenance reportedly was performed in or around 1975 when a section of dislodged stones on the downstream face of the spillway was replaced and pointed.

4.3 Maintenance of Operating Facilities

Reportedly, maintenance of operating facilities is performed on an "as needed" basis. The most recent maintenance of the outlet works is unknown. Reportedly, the lake is not dredged because county park standards require the maintenance of a shallow pond depth.

4.4 Description of Warning System

Reportedly, no formal warning system is in use at the present time. However, surveillance is performed by personnel of the Division of Park Maintenance.

4.5 Evaluation of Operational Adequacy

Although the operation of the dam appears to have been satisfactory, the conditions of the outlet gate and housing and the faces of the spillway are unknown.

Maintenance documentation is poor and the maintenance program for the dam has not been adequate in the following areas:

1. Outlet pipe obstructed by silt at discharge end.
2. Silt layer at intake end of outlet pipe not removed.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

The intensity of storm water runoff that the spillway should be able to handle is based on the size and hazard classification of the dam. This runoff intensity, called the spillway design flood (SDF) is described in terms of return frequency or probable maximum flood (PMF) depending on the extent of the dam's size and potential hazard. According to the "Recommended Guidelines for Safety Inspection of Dams" published by the U.S. Army Corps of Engineers. The SDF for Seeley's Pond Dam falls in a range of 100-year frequency to 1/2 PMF. In this case, the low end of the range, 100-year frequency is chosen since the factors used to select size and hazard classification are on the low side of their respective ranges.

The SDF peak computed for Seeley's Pond Dam is 2510 c.f.s. This value is derived from the 100-year flood hydrograph computed by the use of the HEC-1-DB Flood Hydrograph Computer Program using the SCS Method. Hydrologic computations and computer output are contained in Appendix 4.

The spillway discharge rates were computed by the use of a weir formula appropriate for the configuration of the spillway structure. The spillway discharge with lake level equal to the top of the dam was computed to be 969 c.f.s. For purposes of overtopping analysis, the top of dam was assumed to be the top of the wall at the right end of the spillway. The

SDF was routed through the dam by use of the HEC-1-DB computer program using the modified Puls method. In routing the SDF, it was found that the dam crest would be overtopped by a depth of 1.8 feet. Accordingly, the subject spillway is assessed as being inadequate in accordance with criteria developed by the U.S. Army Corps of Engineers.

b. Experience Data

Whether or not the dam has been overtopped is uncertain. However, during times of heavy rainfall, flooding conditions, in which Diamond Hill Road is sometimes overtopped, reportedly have occurred in the area of the confluence of the Blue Brook and the Green Book. No damage in the flood plain of the dam has been reported as a result of the flooding.

c. Visual Observations

No evidence was found at the time of inspection that would indicate that the dam had been overtopped.

d. Overtopping Potential

As indicated in paragraph 5.1.a., a storm of magnitude equal to the SDF would cause overtopping of the dam to a height of 1.8 feet over the crest of the dam. The spillway is capable of passing approximately 39 percent of the SDF with lake level equal to the top of dam.

e. Drawdown Data

Drawdown of the lake is accomplished by opening the gate in the 12-inch outlet pipe. Total time for drawdown is estimated to be 5 days. (See Appendix 4).

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The dam appeared, at the time of inspection to be outwardly structurally sound with no evidence of structural cracks or distress. No leakage was observed in the dam during inspection. However, the downstream face of the spillway was obscured by discharge.

b. Generalized Soils Description

The generalized soils description of the dam site consists of recent alluvium composed of stratified materials deposited by streams. The alluvium overlies a heavy textured colluvium and residual soil overlying basalt bedrock which is exposed in many locations.

c. Design and Construction Data

Structural stability analyses for the dam are not available. Monthly progress reports for the 1938 renovations indicating that construction was completed in accordance with the plans are available.

d. Operating Records

Reports of inspections made by the State of New Jersey are contained in the NJDEP file. According to the reports, leakage was observed in the dam between the years 1935 and 1939, inclusive.

In 1970, an inspection report prepared on a standardized form indicated that the dam was in generally good condition.

e. Post Construction Changes

In 1939, a new wall was constructed at the right end of the dam and the spillway was extended at its right end. Also, at that time, a new outlet works extending around the right side of the spillway was constructed. The dam and appurtenances has remained virtually unchanged since that time.

f. Seismic Stability

Seeley's Pond Dam is located in Seismic Zone 1 as defined in "Recommended Guidelines for Safety Inspection of Dams," which is a zone of very low seismic activity. Experience indicates that dams in Seismic Zone 1 will have adequate stability under seismic loading conditions if stable under static loading conditions. Seeley's Pond Dam appeared to be stable under static loading conditions at the time of inspection.

SECTION 7: ASSESSMENT AND RECOMMENDATIONS

7.1 Dam Assessment

a. Safety

Based on hydraulic and hydrologic analyses outlined in Section 5 and Appendix 4, the spillway of Seeley's Pond Dam is assessed as being inadequate.

The dam appeared, at the time of inspection, to be outwardly stable. Although no leakage was observed, the downstream face of the spillway, where leakage had been observed previously, was obscured by discharge.

b. Adequacy of Information

Information sources for this study include: 1) field inspection, 2) plans, correspondence and inspection reports in NJDEP file, 3) USGS quadrangle, 4) aerial photography from Union County Planning Board, 5) plans and topographic map in Union County Engineer's file and 6) consultation with various Union County employees. The information outlined is sufficient to allow a Phase I assessment as outlined in "Recommended Guidelines for Safety Inspection of Dams."

Some of the absent data are as follows:

1. Design computations and reports.
2. Soils and geologic report.
3. Maintenance documentation.
4. Lake elevation gaging records.

c. Necessity for Additional Data/Evaluation

Although some data pertaining to Seeley's Pond Dam are not available, additional data are not considered imperative for this Phase I evaluation.

7.2 Recommendations

a. Remedial Measures

Based on hydraulic and hydrologic analyses outlined in paragraph 5.1.a., the spillway is assessed as being inadequate. It is therefore recommended that a professional engineer experienced in the design and construction of dams be engaged in the near future to perform more accurate hydraulic and hydrologic analyses relating to spillway capacity. Based on the findings of these analyses, the need for and type of remedial measures should be determined and then implemented.

The owner should, in the near future, develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

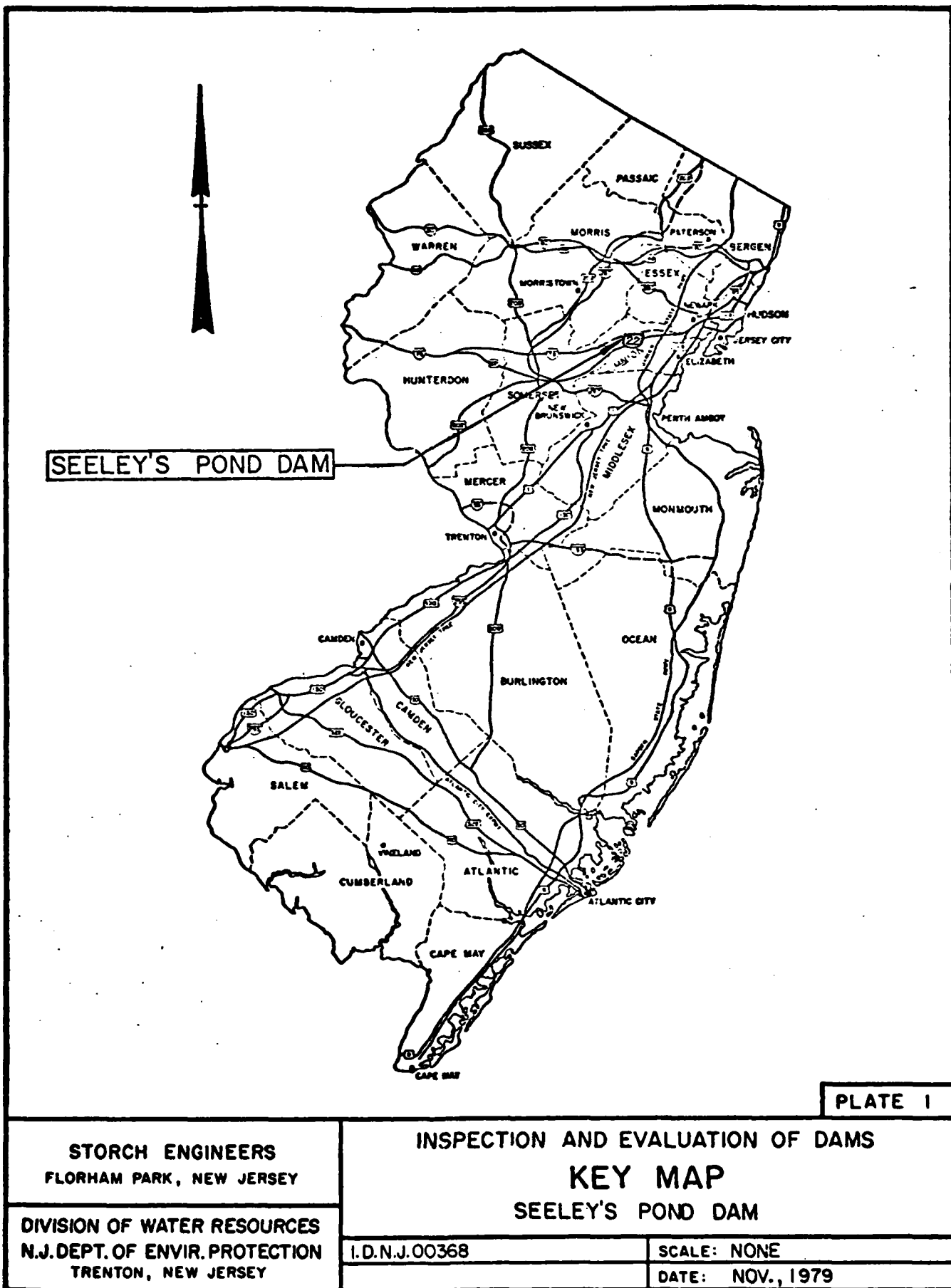
In addition, it is recommended that the upstream and downstream faces of the dam be thoroughly inspected in the near future by a professional engineer experienced in the design and construction of dams. The upstream face should be inspected with the pond drawn down and the downstream face should be inspected with the pond partially drawn down. Based on the inspections, together with any necessary further investigations, the need for and type of remedial measures should be determined and then implemented.

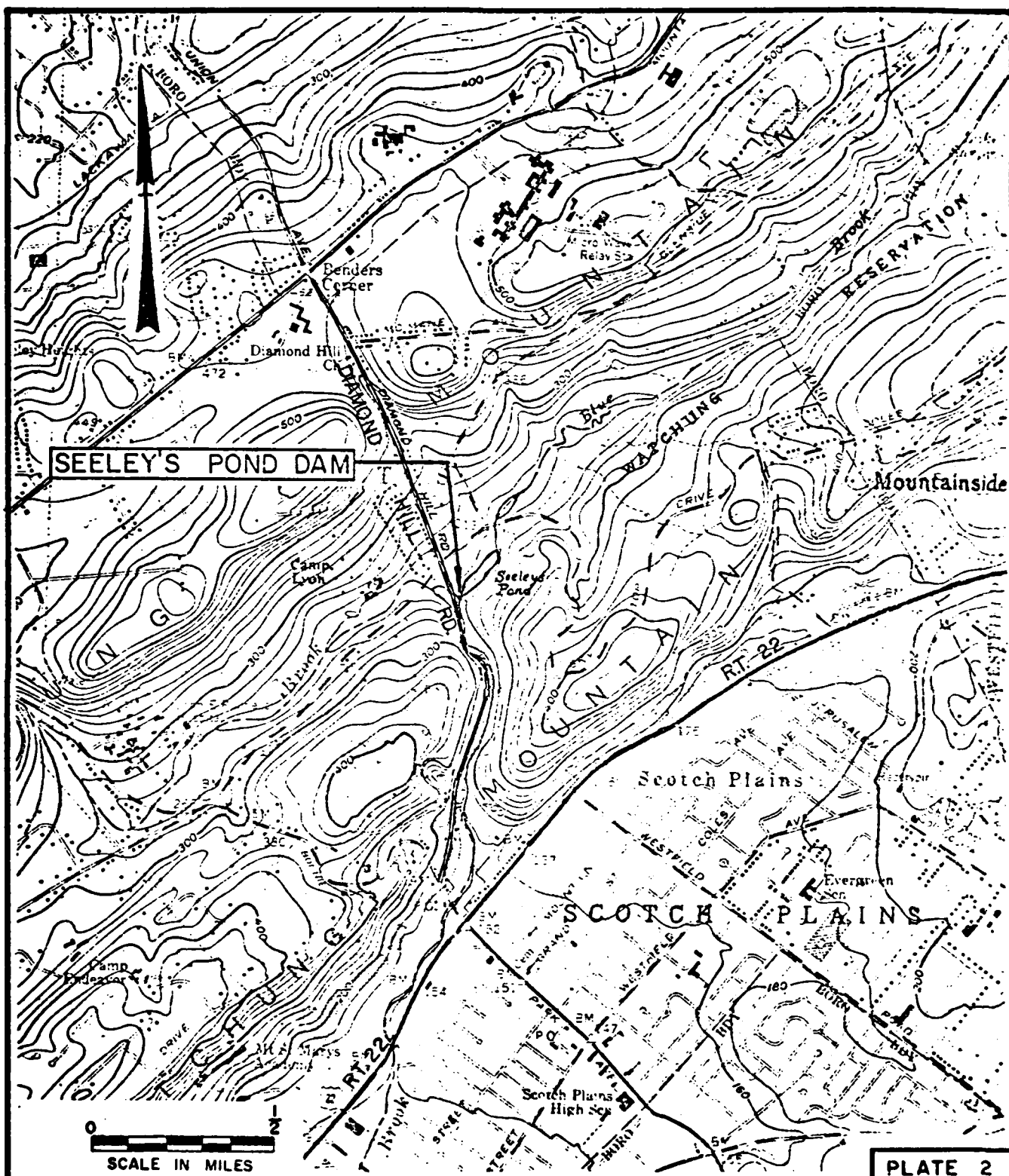
Finally, it is recommended that the outlet works be investigated in the near future and restored to functional condition if necessary and that the outlet pipe be cleaned.

b. Maintenance

In the near future, the owner of the dam should develop written operating procedures and a periodic maintenance plan to insure the safety of the dam.

PLATES





STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

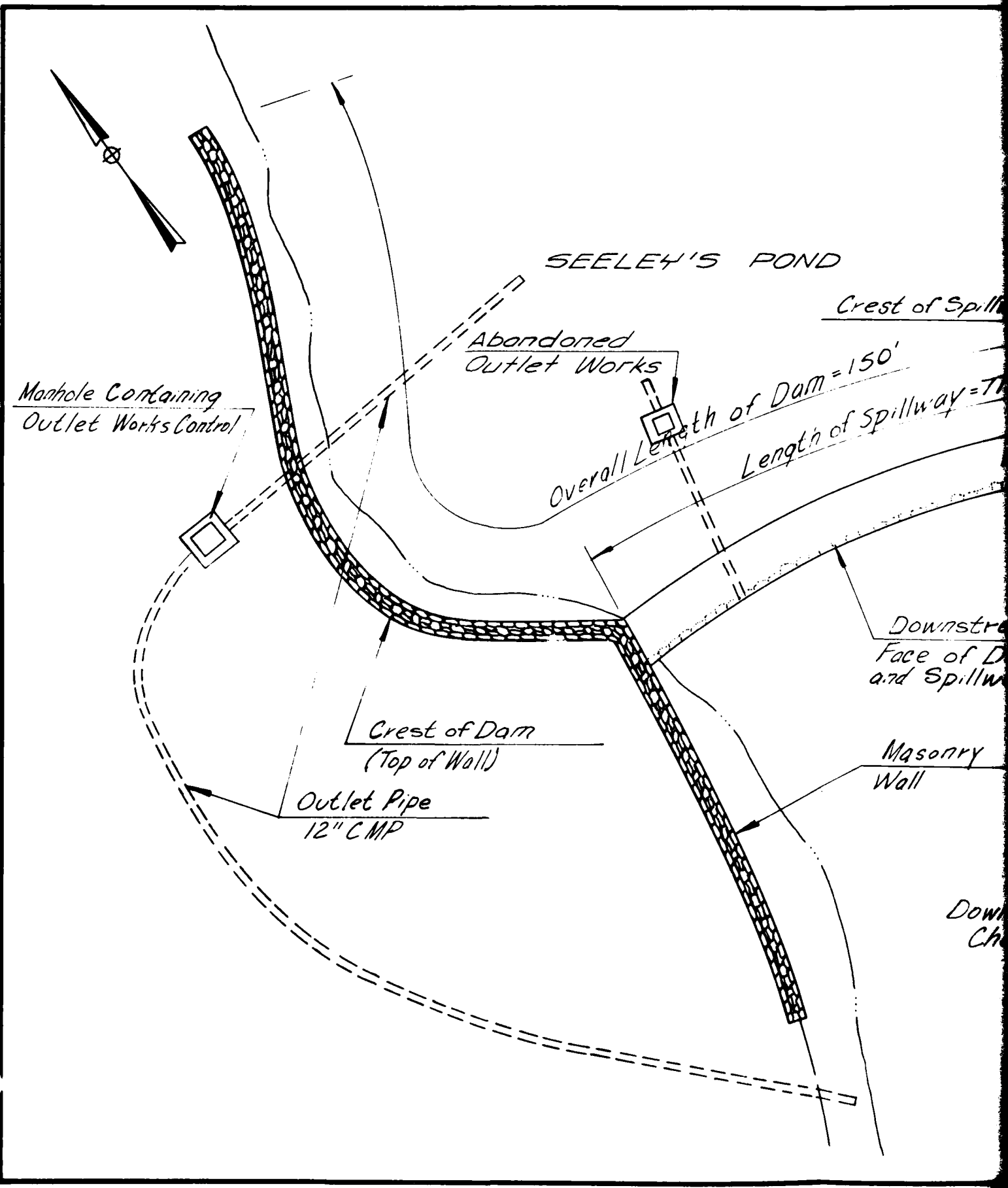
INSPECTION AND EVALUATION OF DAMS
VICINITY MAP
SEELEY'S POND DAM

I.D. N.J. 00368

SCALE: AS SHOWN

DATE: NOV., 1979

DATE: NOV., 1979



Note:

Information taken from plans prepared
by Union County Park Commission dated
Nov. 20, 1938 and field inspection Nov.
15, 1979

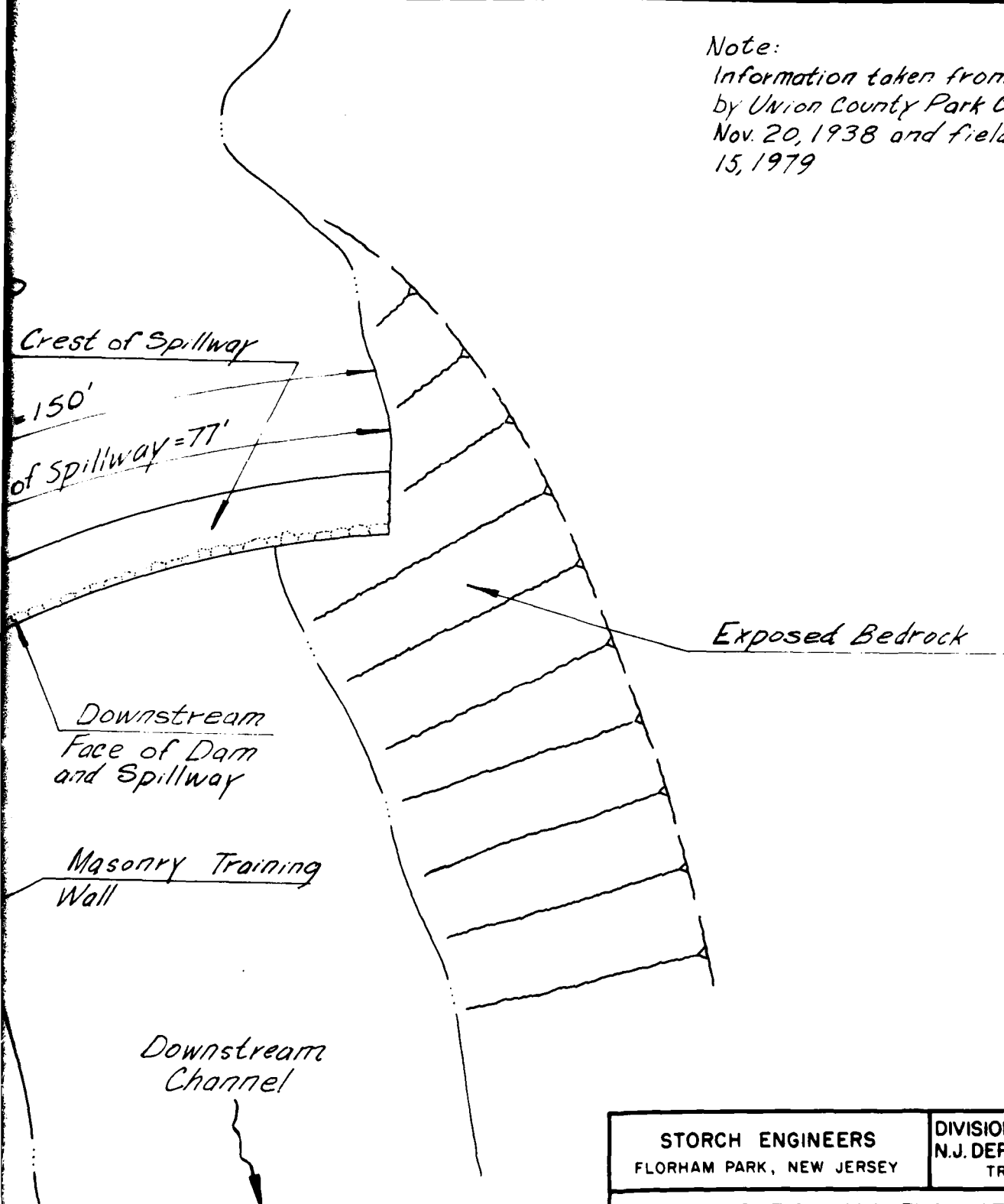


PLATE 4

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCE
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

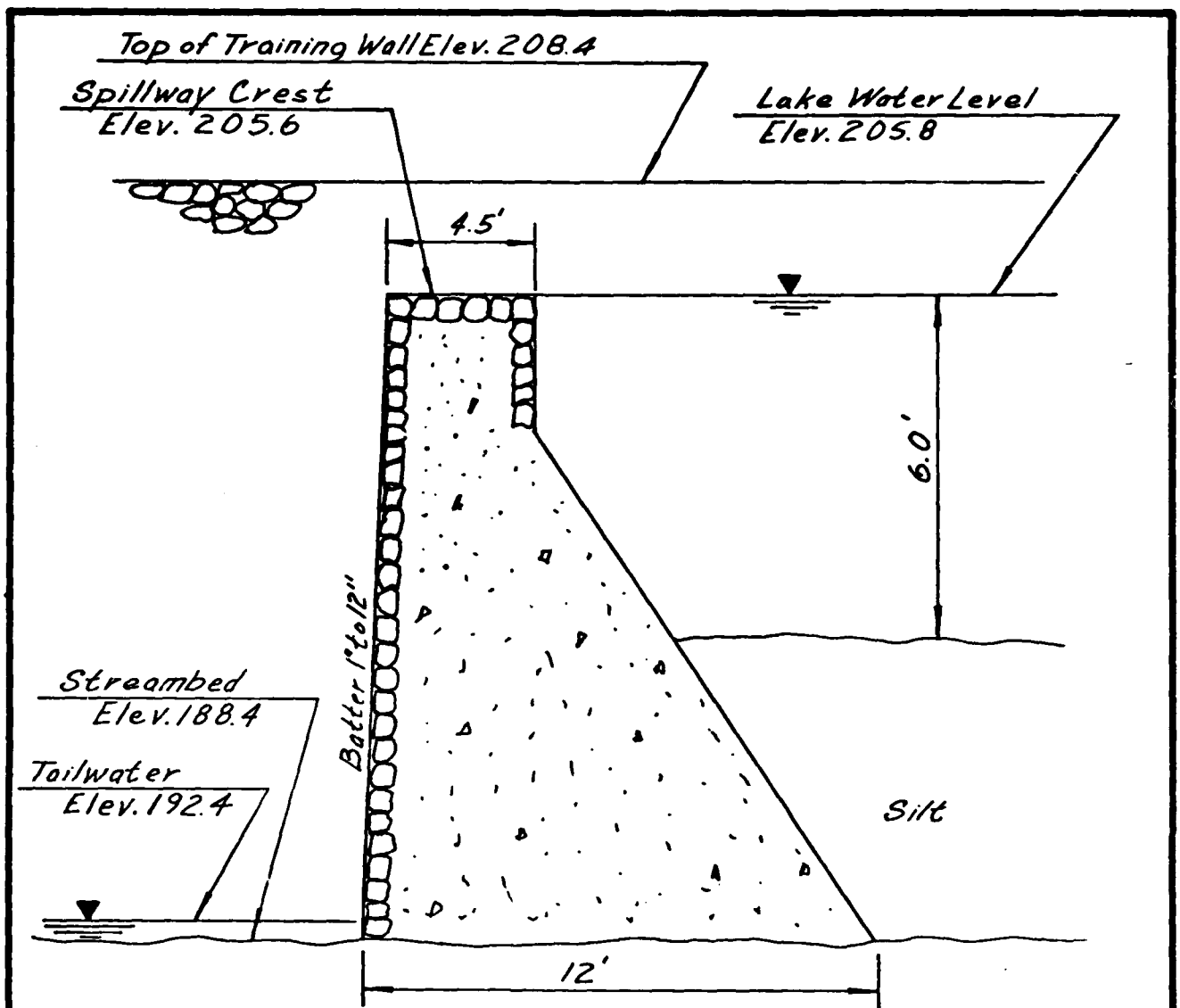
GENERAL PLAN

SEELEY'S POND DAM

I.D. N.J. 003C8

SCALE: NOT TO SCALE

DATE: JAN. 1980



Notes:

1. Information taken from plans prepared by Union County Park Commission dated Nov. 20, 1938 and field inspection Nov. 15, 1979.
2. Elevations based on N.G.V.D. taken from Union County Park Commission plans.

PLATE 5

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

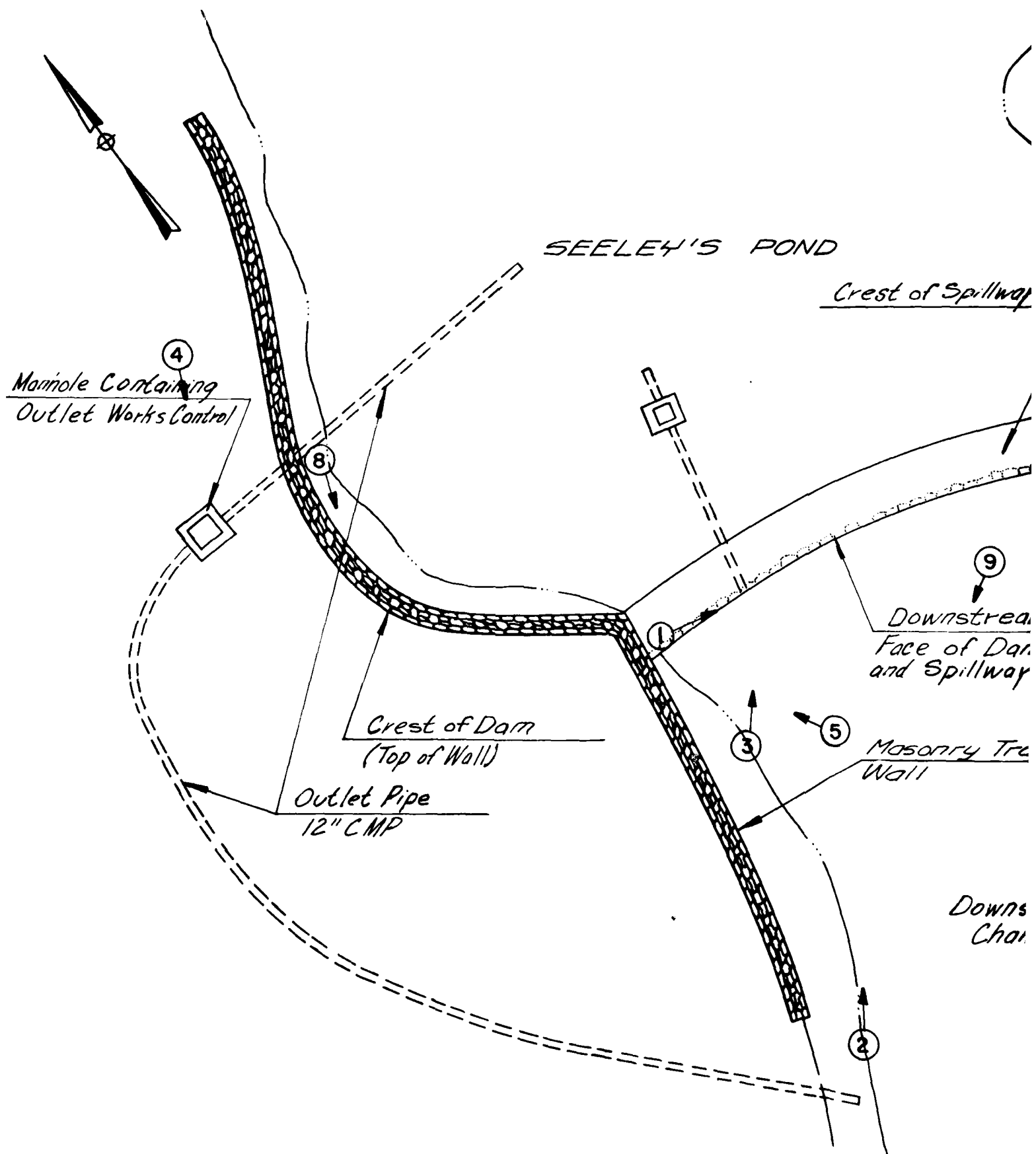
INSPECTION AND EVALUATION OF DAMS

SECTION
SEELEY'S POND DAM

I.D. N.J. 00368

SCALE: AS SHOWN

DATE: DEC. 1979



Note:

Information taken from plans prepared
by Union County Park Commission dated
Nov. 20, 1938 and field inspection Nov.
15, 1979

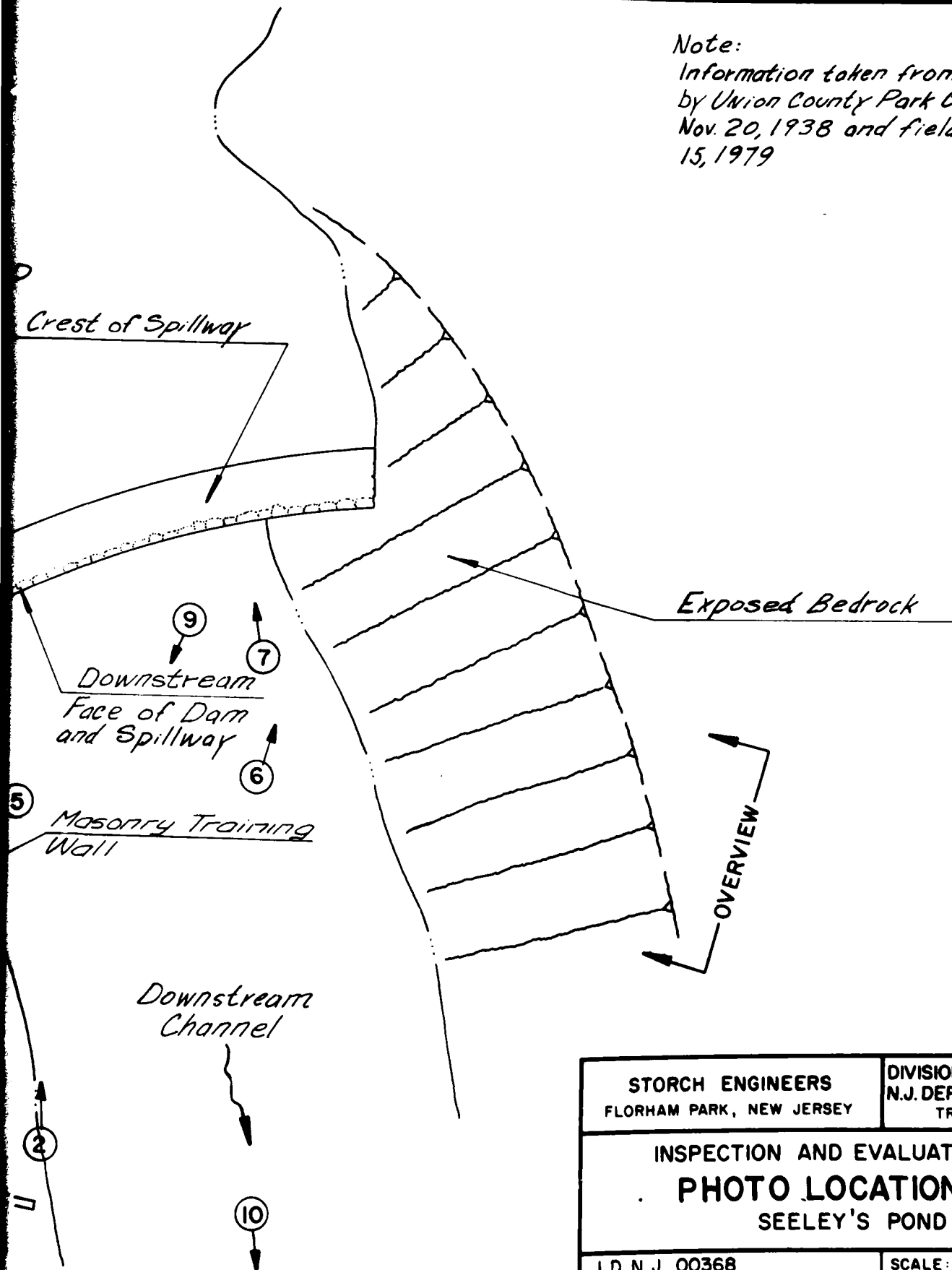


PLATE 6

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS
PHOTO LOCATION PLAN
SEELEY'S POND DAM

I.D.N.J. 00368

SCALE: NOT TO SCALE

DATE: JAN. 1980

APPENDIX 1

Check List - Visual Inspection

Check List - Engineering Data

Check List
Visual Inspection
Phase I

Name of Dam Seeley's Pond Dam County Union State New Jersey Coordinators NJDEP

Date(s) Inspection 11/15/79 Weather P-Cloudy Temperature 50° F

Pool Elevation at Time of Inspection 205.8 M.S.L. Tailwater at Time of Inspection 192.4 M.S.L.

Inspection Personnel:

<u>John Gribbin</u>	<u>Alan Volle</u>
<u>Ronald Lai</u>	<u>Thomas Miller</u>
<u>Richard McDermott</u>	
	<u>J. Gribbin</u> Recorder

Present: Michael J. Cerra, Union County Dept. of Engineering & Planning
Kenneth M. Knutsen, Union County Dept. of Engineering & Planning

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Surface cracks observed in concrete cap on spillway crest.	Most surfaces were stone masonry with conc. cap on spillway crest.
STRUCTURAL CRACKING	No significant cracking observed.	
CONSTRUCTION JOINTS	N.A.	
MONOLITH JOINTS	N.A.	
LEAKAGE	None observed.	Downstream face obscured by discharge. Recommend inspection with lake lowered.
SEEPAGE	None observed.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
GENERAL	Surfaces of downstream face and training wall appeared generally uniform.	Construction is stone masonry with rough surfaces.
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Both abutments appeared to be sound.	Right abutment: stone masonry wall Left Abutment: Trap rock outcrop
DRAINS	None observed	
WATER PASSAGES	None observed	
APRON	None observed	
VERTICAL AND HORIZONTAL ALIGNMENT	Vertical: generally level with slight depression near center Horizontal: approximate arch configuration	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SURFACES IN OUTLET CONDUIT	Conduit submerged and buried - not observed.	
INTAKE STRUCTURE	Submerged - could not be observed.	
OUTLET STRUCTURE	Discharge end of outlet pipe appeared to be sound but partially obstructed with silt.	Discharge end of abandoned outlet pipe was observed in downstream face of dam - appeared to be in sound condition.
OUTLET CHANNEL	Outlet pipe discharges directly into downstream channel of spillway.	
GATE AND GATE HOUSING	Concrete surface of top of manhole appears to be in satisfactory condition steel cover was locked.	

SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CREST	Crest was obscured by discharge but appeared to be generally sound with some surface cracking noted.	Spillway comprises major portion of dam.
APPROACH CHANNEL	N.A.	
DISCHARGE CHANNEL	Spillway discharges directly into downstream channel (Blue Brook)	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	Graduated staff gage in pond fastened to upstream face of stone masonry wall. Face of gage was 10-c cated so as to make observation inconvenient.	USGS gaging station in downstream channel downstream of confluence of Blue Brook with Green Brook.

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The pond shores are generally steep and wooded with rock outcroppings. Average slope approx. 1 vert. to 2 horiz.	
SEDIMENTATION	Soundings in the vicinity of the dam indicate the presence of a silt layer approximately 6 feet thick.	
STRUCTURES ALONG BANKS	None observed.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Channel appeared to be well defined stream with a bottom consisting of rock outcrops, boulders and cobbles. No significant obstructions observed.	Approximately 250 feet downstream from the dam the channel merges with the Green Brook.
SLOPES	Banks are generally wooded and have an average slope of approx. 3 horiz. to 1 vert.	
STRUCTURES ALONG BANKS	A road is located along the channel and two dwellings are located approximately 3000 feet downstream.	The dwellings are approx. 13 feet above the channel bottom.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
DAM - PLAN	Plans by Union County Park Commission dated 1938, revision date illegible.
SECTIONS	
SPILLWAY - PLAN	Same as above
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	Same as above
OUTLETS - PLAN	Same as above
DETAILS	
CONSTRAINTS	
DISCHARGE RATINGS	
HYDRAULIC/HYDROLOGIC DATA	Stream gaging records available from USGS, Trenton, N. J. Office. Records include flow in Green Brook as well as Blue Brook.
RAINFALL/RESERVOIR RECORDS	Not available
CONSTRUCTION HISTORY	Limited data in NJDEP file
LOCATION MAP	Available - Union County

ITEM	REMARKS
DESIGN REPORTS	Not available
GEOLOGY REPORTS	Not available
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Not available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Not available
POST-CONSTRUCTION SURVEYS OF DAM	Available - Union County file
BORROW SOURCES	Not available

ITEM	REMARKS
MONITORING SYSTEMS	Graduated staff gage in pond - records not available
MODIFICATIONS	Spillway extended, training wall added and new outlet works constructed in 1938 - limited description in NJDEP file.
HIGH POOL RECORDS	Not available
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Inspection reports available in NJDEP file.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Limited data in NJDEP file.
MAINTENANCE OPERATION RECORDS	Not available

APPENDIX 2

Photographs



PHOTO 1
CREST OF SPILLWAY



PHOTO 2
DOWNSTREAM FACE OF DAM

SEELEY'S POND DAM
15 NOVEMBER 1979



PHOTO 3

ABANDONED OUTLET PIPE IN DOWNSTREAM FACE OF DAM



PHOTO 4

MANHOLE CONTAINING OUTLET WORKS CONTROL

SEELEY'S POND DAM
15 NOVEMBER 1979



PHOTO 5

TRAINING WALL AT WEST ABUTMENT OF DAM

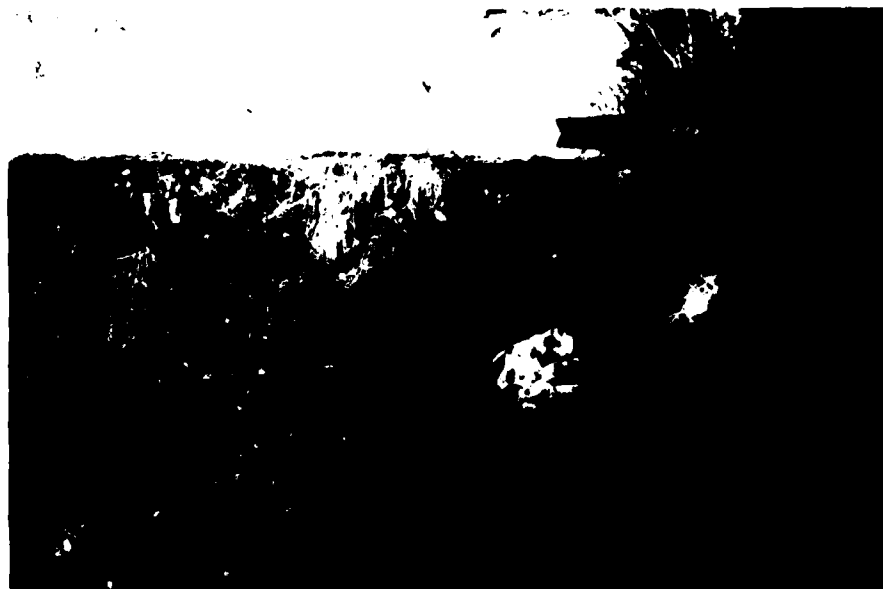


PHOTO 6

EAST ABUTMENT OF DAM

SEELEY'S POND DAM
15 NOVEMBER 1979

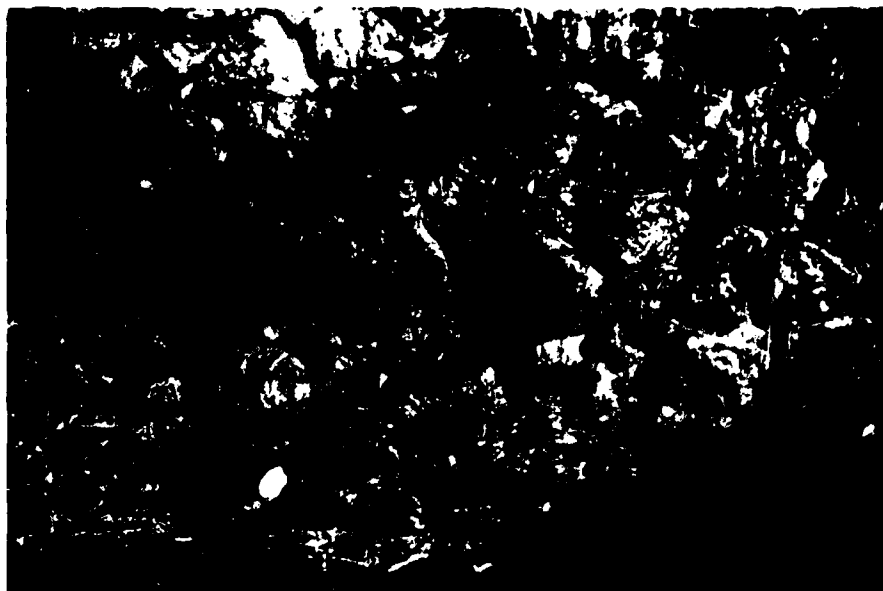


PHOTO 7

DOWNSTREAM FACE OF DAM AT TOE

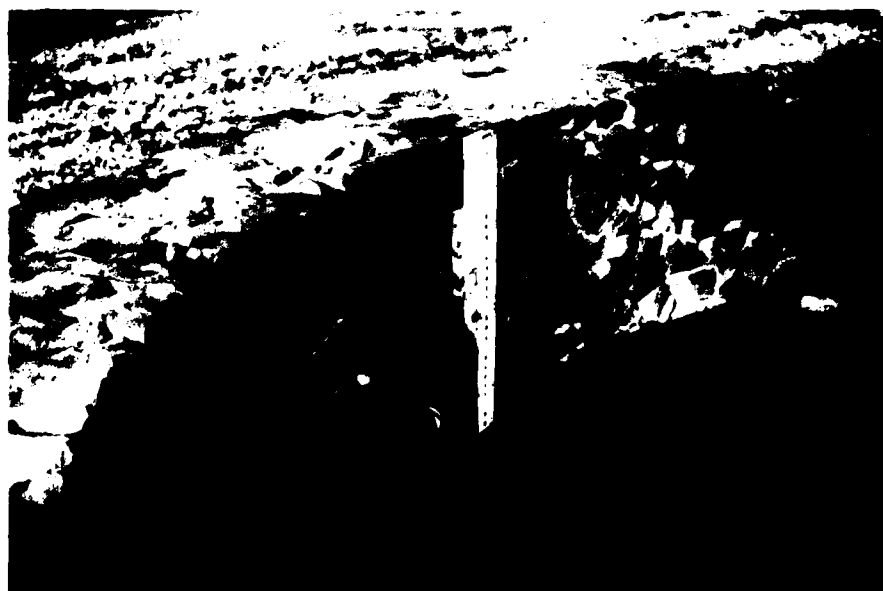


PHOTO 8

GRADUATED STAFF GAGE IN POND

SEELEY'S POND DAM
15 NOVEMBER 1979



PHOTO 9

TRAINING WALL ON WEST SIDE OF DOWNSTREAM CHANNEL



PHOTO 10

DOWNSTREAM CHANNEL

SEELEY'S POND DAM
15 NOVEMBER 1979

APPENDIX 3

Engineering Data

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Mostly wooded

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 205.8 (44 acre - feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N.A.

ELEVATION MAXIMUM DESIGN POOL: 210.2

ELEVATION TOP DAM: 208.4

SPILLWAY CREST: Uncontrolled masonry

- a. Elevation 205.6
- b. Type Broad crested weir
- c. Width 4.5 feet
- d. Length 77 feet
- e. Location Spillover Spillway forms portion of dam
- f. Number and Type of Gates None

OUTLET WORKS: Gated 12-inch pipe

- a. Type Upstream: CMP; Downstream: RCP
- b. Location Around right end of spillway
- c. Entrance inverts 197.0
- d. Exit inverts 192.2
- e. Emergency draindown facilities: Open gate

HYDROMETEOROLOGICAL GAGES: Lake water level gage

- a. Type Graduated staff gage
- b. Location Upstream side of masonry wall
- c. Records None

MAXIMUM NON-DAMAGING DISCHARGE:

(Lake stage equal to top of dam) 969 c.f.s.

APPENDIX 4

Hydraulic/Hydrologic Computations

STORCH ENGINEERS

Sheet 1 of 7

Project SEELEYS POND DAM

Made By STO Date 12-21-79

Chkd By JG Date 12/27/79

HYDROLOGY

HYDROLOGICAL ANALYSIS

INFLOW HYDROGRAPH FOR SEELEYS
POND WILL BE DEVELOPED BY HEC-1-D3
USING SCS TRIANGULAR UNIT HYDROGRAPH,
AND ROUTED BY THE MODIFIED PULS
METHOD. DRAINAGE AREA = 3.4 SQ MI.

INFILTRATION DATA

DRAINAGE AREA IS MAINLY WOODED

USE: INITIAL INFILTRATION 1.5 IN.

CONSTANT INFILTRATION 0.15 IN./HR.

Project Seeley's Pond Dam
1132 CMade By RL Date 12-21-79Chkd By JG Date 12/27/79Time of Concentration

Pg 71 "Design of Small Dams"

$$T_c = \left(\frac{11.9 L^3}{H} \right)^{0.385}$$

 T_c = Time of Concentration in (hr.) L = Length of longest watercourse (Mi) H = Elevation difference in (feet)

$$T_c = \left[\frac{11.9(4)^3}{220} \right]^{0.385}$$

$$= \underline{\underline{1.6 \text{ hr.}}}$$

Time of Concentration"Gray's Method Pg 140" Introduction to
Hydrology " by
Viessman et. al. L = length of main channel in miles S = slope in percent P_R = time to peak (lag time) r = shape and scale parameters

$$L/\sqrt{S} = 4/\sqrt{1.01} = 3.98$$

$$\frac{P_R}{r} = 20$$

$$P_R = 75 \text{ min} = 1.25 \text{ hr.}$$

$$\text{Lag time} = \underline{\underline{1.25 \text{ hr.}}}$$

TIME OF CONCENTRATION

(BY SCS TR-55)

LENGTH OF CHANNEL FLOW = 17,000 FT

AVERAGE SLOPE = 0.5 %

AVERAGE VELOCITY = 1.5 FPS

LENGTH OF OVERLAND FLOW = 4000 FT

AVERAGE SLOPE = 3.5 %

AVERAGE VELOCITY = 1.4 FPS

$$T_c = \left(\frac{17,000}{1.5} + \frac{4000}{1.4} \right) \frac{1}{3600} = 3.1 + 0.8 = 3.9 \text{ HOURS}$$

TIME OF CONCENTRATIONRef "HANDBOOK OF APPLIED
HYDROLOGY" BY CHOW

Pg 14-36

$$T_c^{2.14} = \frac{2}{3} \frac{L^n}{\sqrt{S}}$$

$$T_c^{2.14} = \frac{2}{3} \frac{(4000)(1.04)}{\sqrt{0.035}} \frac{1}{60}$$

T_c = TIME OF CONCENTRATION (MIN)

S = SLOPE

n = 0.4 - ROUGHNESS COEFFICIENT

L = LENGTH OF OVERLAND FLOW (F)

$$T_c = .32 \text{ HOURS} + 3.1 \text{ HOURS (CHANNEL)}$$

$$T_c = 3.4 \text{ HOURS}$$

FOR HEC-1 INPUT USE T_c = 3.5 HOURS
LAG = 0.6 (3.5)

$$\underline{\text{LAG} = 2.1 \text{ HOURS}}$$

STORCH ENGINEERS

Sheet 4 of 7Project SEELEY'S POND DAMMade By STO Date 12/27/70Chkd By JG Date 12/27/7924 HOUR, 100 YEAR RAINSTORM DISTRIBUTIONFOR SEELEY'S POND DAM

TIME (HOUR)	RAIN (INCHES)
1	0.08
2	0.08
3	0.08
4	0.08
5	0.08
6	0.08
7	0.09
8	0.09
9	0.18
10	0.18
11	0.18
12	0.19
13	0.3
14	0.3
15	0.8
16	3.0
17	0.4
18	0.3
19	0.19
20	0.18
21	0.09
22	0.09
23	0.08
24	0.08

FROM TP 40 US WEATHER BUREAU

STORCH ENGINEERS

Sheet 5 of 7

Project SEELEYS POND DAM

Made By STO Date 12-21-79

Chkd By JG Date 12/27/79

LAKE STORAGE VOLUME (FROM USGS)

<u>ELEVATION (MSL)</u>	<u>AREA (ACRES)</u>
193.1	0
205.6	4.5
220	25.7
240	101.9

HEC-1-DB PROGRAM WILL DEVELOP STORAGE
CAPACITY FROM SURFACE AREA AND ELEVATIONS

NOTE:

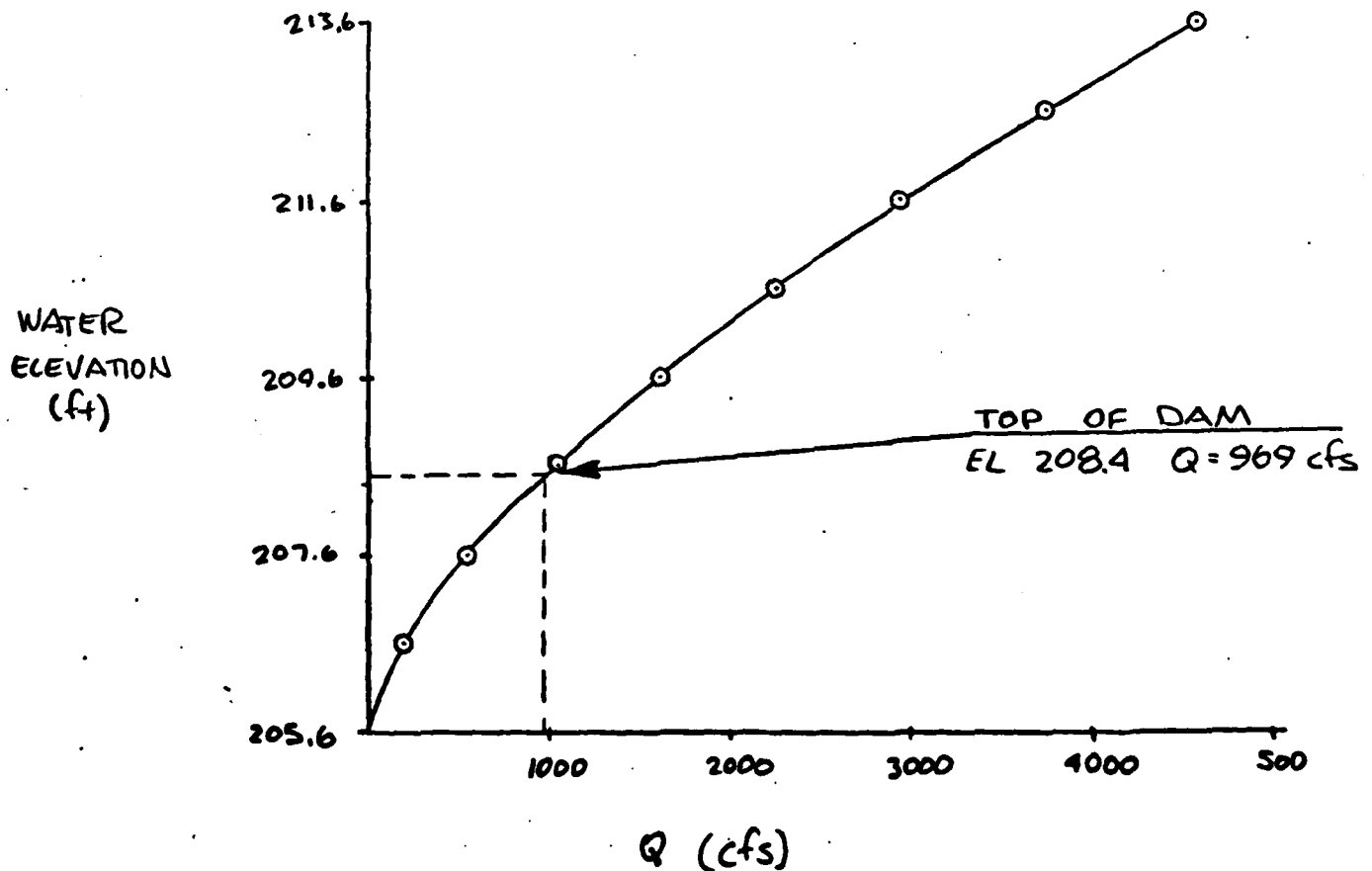
COMPUTED STORAGE CAPACITY WILL BE BASED
ON THE ASSUMPTION THAT THE LAKE BOTTOM
ELEVATION EQUALS THE ORIGINAL STREAM
BED ELEVATION PRIOR TO DAM CONSTRUCTION.
SOUNDINGS AT THE TIME OF INSPECTION INDICATED
THAT THIS ELEVATION IS PRESENTLY HIGHER
DUE TO SILTING.

Project SEELEYS POND DAMMade By STO Date 12-21-77Chkd By JG Date 12/27/79HYDRAULICS

SPILLWAY LENGTH, L 77 FT
 HEAD h
 AVE. DISCHARGE COEFFICIENT, C 2.63
 (FROM BRATER & KING)

DISCHARGE FORMULA $Q = CLh^{3/2}$

h (ft)	0	1	2	2.84	3	4	5	6	7	8
W.L. (ft)	205.6	206.6	207.6	208.4	208.6	209.6	210.6	211.6	212.6	213.6
Q (cfs)	0	202	573	969	1052	1620	2264	2976	3750	4582

SPILLWAY STAGE - DISCHARGE CURVE

STORCH ENGINEERS

Sheet 7 of 7

Project SEELEYS POND DAM

Made By STO Date 1/9/80

Chkd By JG Date 2/1/80

OUTLET WORKS CAPACITY

12 INCH DIAMETER CORRUGATED METAL PIPE

APPROXIMATELY 160' LONG AT 3.0 % SLOPE

SPILLWAY CREST ELEVATION = 205.6

STORAGE = 40 ACRE - FT.

INLET INVERT ELEVATION = 197.0

OUTLET INVERT ELEVATION = 192.2

INLET CONTROL; USING "HYDRAULIC CHARTS FOR
THE SELECTION OF HIGHWAY CULVERTS":

PROJECTING ENTRANCE

H_w = 8.6 Q = 5.3 CFS

Ave H_w = 4.3 Q = 4.0 CFS

Assume inflow = 0

TIME REQUIRED FOR TOTAL DRAWDOWN = $\frac{\text{STORAGE}}{\text{DRAWDOWN}}$

$$T = \frac{40 \text{ AC-FT } (43560 \text{ SF/AC})}{4.0 \text{ CFS } (3600 \text{ SEC/HR})}$$

T = 121 HOURS = 5.0 DAYS

HEC-1-DB COMPUTATIONS

[illegible][illegible]

.....
 FLOOD HYDROGRAPH PACKAGE (REC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 26 FEB 79

RUN DATE 08/01/09
 TIME 08:56:26

NATIONAL DAM SAFETY PROGRAM
 SEELEY'S POND DAM, NEW JERSEY
 100 YEAR STORM ROUTING

JOB SPECIFICATION									
NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	INSTAN
150	0	20	JOPER	5	0	0	0	3	0
						TRACE			

MULTI-PLAN ANALYSES TO BE PERFORMED
 NPLAN=1 NRTIO=1 LRTIO=1

RTIOS= 1.00

.....

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH TO SEELEY'S POND DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLI	JPRI	ISAME	ISAGE	IAUTO
LAKE	0	0	0	0	0	0	0	0

HYDROGRAPH DATA				RATIO		ISAME		LOCAL	
INVOG	IUNG	TAREA	SNAP	TRSDA	TRSPC				
0	2	3.40	0.00	3.40	0.00				

PRECIP DATA				DAK	
NP	STORM	OAJ	PATTERN		
72	0.00	0.00	0.00		

LOSS DATA		RTIOK		STRTL		CNSTL		ALSHK		RTIMP	
LROPT	STMR	OLTKR	RTIOL	ERAIN	STRS						
0	0.00	0.00	1.00	0.00	0.00	1.50	.15	0.00	0.00		

UNIT HYDROGRAPH DATA		RECESSION DATA	
TC	LAG	GRCSN	RTIOR
0.00	2.10	-0.05	2.00

UNIT HYDROGRAPH 33 END OF PERIOD ORIGINATES, TC=		HOURS, LAG=		VOL=	
272.	235.	22.	17.	0.00	1.00
134.	300.	622.	117.	2.10	609.
228.	22.	149.	11.	684.	514.
2.	1.	14.	11.	72.	45.

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL	VOLUME
2510.	1405.	402.	194.		29103.
71.	384.	110.	432.		4242.
	97.92	111.82	112.36		112.36
	637.	798.	802.		802.
	859.	984.	989.		989.

CFS
CMS
INCHES
AC-FT
THOUS CU M

HYDROGRAPH AT STA LAKE FOR PLAN 1, RTIO 1

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL	VOLUME
2510.	1405.	402.	194.		29103.
71.	384.	110.	432.		4242.
	97.92	111.82	112.36		112.36
	637.	798.	802.		802.
	859.	984.	989.		989.

CFS
CMS
INCHES
AC-FT
THOUS CU M

HYDROGRAPH ROUTING

ROUTE DISCHARGE THROUGH DAM

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRJ	INAME	ISTAGE	IAUTQ
DAM	1	0	0	0	0	0	0	0

GLOSS	CLOSS	AVG	IRES	ROUTING DATA	IOPT	IPMP	LSTR
0.0	0.00	0.00	1	ISAME	0	0	0

NSTPS	NSTD	LAG	AMSK	X	TSK	STORA	ISPRAT
1	0	0	0.00	0.00	0.00	-206.	-1

STAGE	205.60	207.60	208.40	208.60	209.60	211.60	212.60	213.60
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FLOW	0.00	573.00	969.00	1052.00	1620.00	2976.00	3750.00	4582.00
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CAPACITY	0.	40.	352.	2072.
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ELEVATION	197.	206.	220.	240.
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CREL	SPHID	COQM	EXPW	ELEVL	COOL	CAREA	EXPL
205.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TOPEL	COQO	EXPD	DAMVIC
208.4	2.6	1.5	73.

STATION DAM PLAN 1.0 RATIO 1

MO.DA	HR.MN	END-OF-PERIOD PERIOD	HYDROGRAPH HOURS	INFLW	OUTFLOW	STORAGE	STAGE
1.01	.20	1	.33	3.0	1.0	40.0	2205.6
1.01	.40	2	.67	3.0	1.0	40.0	2205.6
1.01	.60	3	1.00	3.0	1.0	40.0	2205.6
1.01	.80	4	1.33	3.0	1.0	40.0	2205.6
1.01	1.00	5	1.67	3.0	1.0	40.0	2205.6
1.01	1.20	6	2.00	3.0	1.0	40.0	2205.6
1.01	1.40	7	2.33	3.0	1.0	40.0	2205.6
1.01	1.60	8	2.67	3.0	1.0	40.0	2205.6
1.01	1.80	9	3.00	3.0	1.0	40.0	2205.6
1.01	2.00	10	3.33	3.0	1.0	40.0	2205.6
1.01	2.20	11	3.67	3.0	1.0	40.0	2205.6
1.01	2.40	12	4.00	3.0	1.0	40.0	2205.6
1.01	2.60	13	4.33	3.0	1.0	40.0	2205.6
1.01	2.80	14	4.67	3.0	1.0	40.0	2205.6
1.01	3.00	15	5.00	3.0	1.0	40.0	2205.6
1.01	3.20	16	5.33	3.0	1.0	40.0	2205.6
1.01	3.40	17	5.67	3.0	1.0	40.0	2205.6
1.01	3.60	18	6.00	3.0	1.0	40.0	2205.6
1.01	3.80	19	6.33	3.0	1.0	40.0	2205.6
1.01	4.00	20	6.67	3.0	1.0	40.0	2205.6
1.01	4.20	21	7.00	3.0	1.0	40.0	2205.6
1.01	4.40	22	7.33	3.0	1.0	40.0	2205.6
1.01	4.60	23	7.67	3.0	1.0	40.0	2205.6
1.01	4.80	24	8.00	3.0	1.0	40.0	2205.6
1.01	5.00	25	8.33	3.0	1.0	40.0	2205.6
1.01	5.20	26	8.67	3.0	1.0	40.0	2205.6
1.01	5.40	27	9.00	3.0	1.0	40.0	2205.6
1.01	5.60	28	9.33	3.0	1.0	40.0	2205.6
1.01	5.80	29	9.67	3.0	1.0	40.0	2205.6
1.01	6.00	30	10.00	3.0	1.0	40.0	2205.6
1.01	6.20	31	10.33	3.0	1.0	40.0	2205.6
1.01	6.40	32	10.67	3.0	1.0	40.0	2205.6
1.01	6.60	33	11.00	3.0	1.0	40.0	2205.6
1.01	6.80	34	11.33	3.0	1.0	40.0	2205.6
1.01	7.00	35	11.67	3.0	1.0	40.0	2205.6
1.01	7.20	36	12.00	3.0	1.0	40.0	2205.6
1.01	7.40	37	12.33	3.0	1.0	40.0	2205.6
1.01	7.60	38	12.67	3.0	1.0	40.0	2205.6
1.01	7.80	39	13.00	3.0	1.0	40.0	2205.6
1.01	8.00	40	13.33	3.0	1.0	40.0	2205.6
1.01	8.20	41	13.67	3.0	1.0	40.0	2205.6
1.01	8.40	42	14.00	3.0	1.0	40.0	2205.6
1.01	8.60	43	14.33	3.0	1.0	40.0	2205.6
1.01	8.80	44	14.67	3.0	1.0	40.0	2205.6
1.01	9.00	45	15.00	3.0	1.0	40.0	2205.6
1.01	9.20	46	15.33	3.0	1.0	40.0	2205.6
1.01	9.40	47	15.67	3.0	1.0	40.0	2205.6
1.01	9.60	48	16.00	3.0	1.0	40.0	2205.6
1.01	9.80	49	16.33	3.0	1.0	40.0	2205.6
1.01	10.00	50	16.67	3.0	1.0	40.0	2205.6
1.01	10.20	51	17.00	3.0	1.0	40.0	2205.6
1.01	10.40	52	17.33	3.0	1.0	40.0	2205.6
1.01	10.60	53	17.67	3.0	1.0	40.0	2205.6
1.01	10.80	54	18.00	3.0	1.0	40.0	2205.6
1.01	11.00	55	18.33	3.0	1.0	40.0	2205.6
1.01	11.20	56	18.67	3.0	1.0	40.0	2205.6
1.01	11.40	57	19.00	3.0	1.0	40.0	2205.6
1.01	11.60	58	19.33	3.0	1.0	40.0	2205.6
1.01	11.80	59	19.67	3.0	1.0	40.0	2205.6
1.01	12.00	60	20.00	3.0	1.0	40.0	2205.6
1.01	12.20	61	20.33	3.0	1.0	40.0	2205.6
1.01	12.40	62	20.67	3.0	1.0	40.0	2205.6
1.01	12.60	63	21.00	3.0	1.0	40.0	2205.6
1.01	12.80	64	21.33	3.0	1.0	40.0	2205.6
1.01	13.00	65	21.67	3.0	1.0	40.0	2205.6
1.01	13.20	66	22.00	3.0	1.0	40.0	2205.6
1.01	13.40	67	22.33	3.0	1.0	40.0	2205.6
1.01	13.60	68	22.67	3.0	1.0	40.0	2205.6
1.01	13.80	69	23.00	3.0	1.0	40.0	2205.6
1.01	14.00	70	23.33	3.0	1.0	40.0	2205.6
1.01	14.20	71	23.67	3.0	1.0	40.0	2205.6
1.01	14.40	72	24.00	3.0	1.0	40.0	2205.6
1.01	14.60	73	24.33	3.0	1.0	40.0	2205.6
1.01	14.80	74	24.67	3.0	1.0	40.0	2205.6
1.01	15.00	75	25.00	3.0	1.0	40.0	2205.6

SUMMARY OF DAM SAFETY ANALYSIS

.....	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 205.60 40. 0.	SPILLWAY CREST 205.60 40. 0.	TCP OF DAM 208.40 101. 969.	DURATION OVER TCP HOURS	MAXIMUM OUTFLOW CFS	MAXIMUM STORAGE AC-FT	MAXIMUM DEPTH OVER DAM	MAXIMUM RESERVOIR W.S.ELEV	RATIO OF PMF	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	210.18	1.78	139.	2447.	3.67	18.00	0.00					

APPENDIX 5

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